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Ref:EPR-F

Joseph A. Legare  
Assistant Manager for Environment and  
Infrastructure  
U.S. Department of Energy  
Rocky Flats Field Office  
10808 Highway 93, Unit A  
Golden, Colorado 80403-8200

RE: Preliminary Draft Work Plan Modeling and Conceptual Design of Evapotranspiration  
Covers at RFETS

Dear Mr. Legare:

The Environmental Protection Agency (EPA) and the Colorado Department of Public Health and the Environment (CDPHE) have reviewed the above referenced work plan. This work plan proposes use of evapotranspiration (ET) covers as a component of final closure for the Present Landfill and the Solar Evaporation Ponds (SEP's). We have developed a list of comments relative to the workplan which are attached for your consideration.

This work plan is a good beginning in addressing the many issues associated with landfill closure and cap design. We have a few overall concerns which warrant attention for laying the ground work for development of this project. The first is the need for a comprehensive analysis of how each cover will interrelate with other components at the site such as ground water and surface water. Each cover must be evaluated within the context of overall system performance. The second major concern involves your proposal to utilize data from other sites in lieu of test plots at Rocky Flats. In order for your proposal to be acceptable, it must be supported by strong technical and engineering analysis, including but not limited to elements such as a vigorous monitoring program (performance and compliance), site specific modeling data, existing and borrow soil analysis, vegetation specifications, and an evaluation of landfill gas impacts. We are also concerned that the final cover be consistent with site-wide long term monitoring plans. These and other issues will need to be further expanded upon. Please see the attachment for further details.

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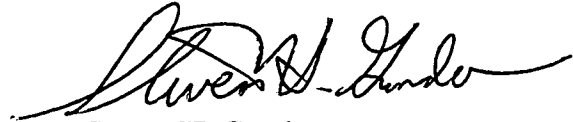
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We look forward to working with you on this project. If you have any questions, please contact Carl Spreng at (303) 692-3358 or Jean Lillich at (303) 312-6258.

Sincerely,



Timothy Rehder  
RFCA Project Coordinator  
US Environmental Protection Agency



Steven H. Gunderson  
RFCA Project Coordinator  
Colorado Department of Public  
Health & Environment

Comments on the

**PRELIMINARY DRAFT WORK PLAN  
MODELING AND CONCEPTUAL DESIGN  
EVAPOTRANSPIRATION COVERS AT RFETS  
July 23, 2001**

by the  
Colorado Department of Public Health & Environment

1. Section 2, p. 3  
Achieving regulatory compliance and Data Quality Objectives should be included in the list of project goals.
2. Section 3.1, p. 5, 2<sup>nd</sup> paragraph  
The Ft. Carson landfills were not approved by CDPHE for acceptance of hazardous waste, but rather for municipal solid waste.
3. Section 3.1, p. 5, last paragraph  
The conclusion that because the RMA demonstration test plots appear to be performing successfully indicate that the ET covers at RFETS also will work is premature and speculative. Until items such as soil and biota barrier material evaluation, construction specifications, Quality Assurance requirements, vegetation standard, O&M plans, and other parameters are defined, it is an extrapolation to presume that the ET covers at RFETS will work.
4. Section 3.3, p. 6  
It seems naïve to state that constructing ET covers is "uncomplicated". It is our experience that earthwork contractors are used to working with soil in a "structural" sense. Compaction to densify soils is a typical part of every job. To require a contractor to efficiently and economically place soils between 80% to 90% of standard Proctor density requires creativity and skill. Items contractors rarely consider, such as how vehicle and equipment traffic on top of finished surfaces will push a previously accepted area out of specification, are critical to this project.
5. Section 5.2.1, p. 15, last bullet  
Asphalt, brick, and probably concrete from RFETS demolition are probably not appropriate materials to be used for a biota barrier. In addition to questionable longevity, specific gradation requirements of the material are key to the intended design function of preventing intrusion from animals such as prairie dogs or badgers. It is impossible to obtain a designed gradation from the miscellaneous demolition debris described.



6. Section 5.2.1, p. 16, 1<sup>st</sup> paragraph  
The last sentence implies that the UNSAT-H model was the determining factor in approving similar covers at RMA. Please clarify that test plot demonstration was really the overriding consideration, and modeling played a secondary role.
7. Table A-1, pg A-2  
1) The design criteria for "Particle Size Distribution" should include a requirement for the -200 sieve (fines content) as well as the No. 4 sieve. 2) The Atterberg Limit values are off by two significant figures. According to ASTM procedures, liquid limit, plastic limit, and plasticity index are all reported to the nearest 1 percent. 3) Although presumed to be correct, soil densities in the U.S. for geotechnical purposes are normally not reported in metric units. 4) Climate data should be site specific, if possible. Therefore, data from RFETS should be used for modeling rather than from Stapleton Airport.
8. Table A-1, p. A-4  
The cobble size criteria only mentions prairie dogs. However, Section 5.2.4 on page 19 also discusses badgers. The biota barrier should be designed to prevent intrusion by burrowing animals anticipated by a wildlife biologist.
9. Section 1.3, P. A-9  
Include the ASTM tests that will be used to develop capillary-soil moisture relationships.
10. Section 1.5, p. A-12, 1<sup>st</sup> bullet  
EPA guidance for slopes is 3% to 5%. The 0.5% mentioned for the SEPs are way too flat, which could potentially induce ponding, while the 25% slopes at the Present Landfill are way too steep, which would lead to channel development and excessive erosion.
11. Section 1.9, p. A-15, 2<sup>nd</sup> paragraph  
The guidance used by the RMA team for landfill and other cover systems is the following:  
"Technical Guidance Document, QA and QC for Waste Containment Facilities, EPA/600/R-93/182, Sep. 1993"  
This document should be referenced and used at RFETS.
12. Section 5.2.5, p. 20  
Plants selected as suitable for an ET cover will need to be compatible with vegetation plans and protocols of the eventual site land manager, anticipated to be U.S. Fish & Wildlife Service.
13. Section 3, p. A-17  
If the biota barrier also acts as a capillary break, then it must be designed to more stringent requirements than if its only design function is to prevent biota intrusion into the contained waste. Therefore, the use of demolition debris material as a biota barrier will not be appropriate. See comment 4.

14. Section 3.1.1, p. B-4 and B-5

Change the first bullet under Functional Design Criteria to "Anticipated future land use is Wildlife Refuge."

Cover performance and compliance monitoring requirements could be added to the Uncertainties and Constraints list.

15. Page C-2, 1<sup>st</sup> paragraph

The Site Wide Water Balance model should be referenced if it will be used to jointly consider cover and groundwater results.

16. Page C-2, 2<sup>nd</sup> paragraph

The onsite climate data is more applicable than data from the airport.

17. Section 5, p. C-8, 1<sup>st</sup> paragraph

The validation of the RMA test plot data against the UNSAT-H modeling results would be an important step in the credibility and acceptance cited as reason to use this model.

The reference to informal discussions with regulators about making UNSAT-H the standard model required for design performance is not appropriate. The State's position is not to sanction any one model. The process of evaluating the best model for the job will continue to be important for any modeling proposed to the CDPHE.

18. Section 6, p. C-9

The list of UNSAT-H advantages should focus on how well the model handles the technical parameters, e.g., vegetation parameters, which are cited as a disadvantage elsewhere, and the effects of snowmelt or freezing.

- The general site configuration, topography, surrounding features, and possible interferences with the ET cover
- A general description of the SEPs history and the nature of the contamination that is present
- A description of soil characteristics (including boring locations) and levels of contamination
- Details of the ground-water and surface-water characteristics (for example, depth to ground water, flow directions, leachate characteristic, location of monitoring wells, and location of surface water monitoring stations, if applicable)
- A description of the local site geology
- Cover system boundaries and compliance points
- A summary of actions that will take place at the SEPs prior to construction of the cover

The conceptual overview for the Present Landfill and the SEPs should also summarize the following aspects of the ET cover at a minimum:

- A description of additional activities that are planned to characterize vegetation, soil, surface water, ground-water, and underlying waste material
- General characteristics of the cover, including a description of the cover components, gradefill requirements, minimum thicknesses, and slopes
- Allowance for erosion loss (wind and water)
- A description of the future use of the area and cover maintenance requirements
- Institutional controls for demarcation of the cover areas, controlling access, and providing a permanent record of the location of the SEPs and Present Landfill
- Performance and compliance monitoring requirements for the cover, including measured infiltration, soil erosion, adequate vegetation coverage, and settlement
- Contingency plans if the performance and compliance monitoring indicates corrective action is necessary
- Air quality considerations

## SPECIFIC COMMENTS

25. **Section 3.1, Page 5.** This section describes alternative cover regulatory compliance and states that the ET cover demonstration project at the Rocky Mountain Arsenal "indicates

the effective performance of ET covers." However, the test cycle for the ET test plots at the Rocky Mountain Arsenal will not be completed until September of 2001. Although preliminary test data from the test plots looks favorable, it is premature to state that the data is conclusive until the test cycle is complete, reviewed, and documented. This section should be revised to make this distinction.

26. **Section 3.2, Page 5.** This section addresses erosion control and indicates that erosion can be controlled on the ET cover using an erosion protection layer that consists of clayey soil with cobble and gravel surface armoring. However, it is not clear how this type of erosion protection will be integrated with the cover vegetation. This section should be revised to describe how protection from wind erosion will be accomplished while maintaining adequate vegetation density on the ET cover.
27. **Section 5.2.1, Page 15, Paragraph 2.** This section discusses modeling, design, and performance of ET covers. The second paragraph implies that an ET cover is acceptable if results of a computer model based on the proposed design show that the "design performance" criterion of a de minimus infiltration rate of 1 to 3 millimeters per year is achieved. However, computer modeling results alone are not acceptable substitute for representing full scale performance. In the case of Rocky Mountain Arsenal, acceptability will be based on the actual measurement of infiltration through the cover of "test plots" and will not be based on the results of a computer model. This section should be revised to describe the distinction between "design performance" and "test plot performance."
28. **Section 5.2.1, Page 15, Last Bullet.** This bullet indicates that rock, crushed concrete, asphalt, and/or brick may be considered for use as biota barrier material. Durable rock, such as granite, is acceptable as biota barrier material. However, the other items listed (crushed concrete, asphalt, and brick) lack durability and are generally not acceptable as biota barrier material. All materials to be used as biota barrier will be required to meet durability and other requirements to ensure longevity of the biota barrier.
29. **Section 5.2.2, Page 16, Paragraph 1.** This paragraph describes monitoring instrumentation. The monitoring program should include installation of lysimeters in addition to heat dissipation sensors and time-domain reflectometry.
30. **Section 5.2.2, Page 17.** This section describes recommendations for monitoring and data gathering. It is explained that performance data from similar ET cover demonstration projects may allow the ET covers for the Present Landfill and the SEPs at Rocky Flats to move directly to construction without constructing field-scale pilot tests. A detailed comparison of specific components of the proposed Rocky Flats design and the design and performance of other ET cover demonstration projects must be submitted. At a minimum, the following types of information should be compared and evaluated:

- Soil, including storage, saturated and unsaturated hydraulic characteristics
  - Vegetation, including root density functions and leaf area index
  - Climatology, including precipitation, solar radiation, wind speed, evaporation, and cloud cover
  - Performance, including measured moisture profile and infiltration
7. **Section 5.2.3, Page 18.** This section addresses landfill gas generation and explains that the ET cover will allow landfill gas to passively vent through the ET cover soil. However, this section also explains that the final land use will be as "open space." It is not clear if allowing landfill gas to passively vent will be protective of open space users. It is also not clear how passive venting of the landfill gas will impact the cover vegetation. An evaluation of landfill gas generation should be conducted, and supporting information should show that management of the landfill gases will be protective of open space users, compatible with vegetation requirements for proper performance of the ET cover, and in compliance with requirements for emissions of hazardous air pollutants.
  8. **Section 5.2.4, Page 19.** This section discusses the evaluation and recommendations for construction materials. The second paragraph indicates that considerably more geotechnical and hydraulic testing of actual borrow soils will be required. However, the types of tests are not identified. This section should identify the types of tests that will be performed. These tests should include, but not be limited to, saturated and unsaturated hydraulic characteristics, particle size distribution, Atterberg limits, Proctor compaction, and shear strength.
  9. **Appendix A.** This appendix discusses proposed design criteria. The first page, second paragraph indicates that the design life of each site will be 1,000 years. This is acceptable and should be used consistently throughout the document. The 1,000-year design life should be applicable to all components of the design, including 1,000-year flood plain, run-on and runoff control, and erosion resistance. Therefore, Table A-1 should be revised to indicate that the 1,000-year design life is applicable to all aspects of the design.
  10. **Appendix A, Table A-1.** The table presents proposed design criteria for the landfill and the SEPs. The items discussed in the following paragraphs should be revised or additional rationale should be provided.
    11. The design criteria for the maximum slope at the Present Landfill is described as 25 percent. However, EPA guidance for covers is a maximum of 5 percent (EPA 1991) unless special design features minimize erosion. The design analysis should provide the technical rationale for slopes greater than 5 percent, including details regarding any special design features necessary for stability.



12. The design criteria for the minimum slope at the SEPs states that the cover will be designed to a grade of 0.5 percent. However, according to EPA guidance, covers should be designed to have slopes no less than 3 percent (EPA 1991). The SEPs slopes should be revised to meet EPA guidance.
13. Two different criteria are provided for the design life: 30 years per the Resource Conservation and Recovery Act (RCRA) Subtitle C and 200 to 1000 years per Uranium Mine Tailings Radiation Control Act (UMTRCA). However, the summary on page A-1 explains that the 1,000-year design criterion will be used for the ET covers at the Present Landfill and the SEP. The table should be revised to reflect only the 1,000-year design criterion.
14. The term "concrete waste" is used in the section discussing requirements for the vent layer. This should be revised to "recycled concrete or approved material meeting approved project specifications."
15. The biota barrier specification indicates a requirement for a specific "cobble size." This should be revised to a "gradation" requirement. In addition, the badger and not the prairie dog should be listed as the largest animal expected to burrow at the site.
16. The thickness of the biota barrier for the SEP is described on the table as a minimum of 1 foot. However, on page 15 of the work plan, the biota barrier is described as being an 18-inch-thick layer of material. The table should be revised to be consistent with the text of the document.
17. Several proposed criteria and parameters use the terms "Specified by Modeler" or "Specified by Engineer" as the basis for the proposed application. The specific technical rationale for using the criteria or parameter should be provided.
11. **Appendix A, Section 1.2.2, Page A-7.** This section discusses climatological parameters. The last paragraph indicates that there are known climatological differences between Stapleton and Rocky Flats and that the climatological data from Stapleton will not reflect known differences in the parameters for wind-speed and solar radiation, both of which affect the water balance calculated in UNSAT-H. This section should discuss how climatological parameters representative of Rocky Flats will be determined and used in the model.
12. **Appendix A, Section 1.2.3, Page A-7.** This section discusses vegetation parameters to be used in the UNSAT-H model. The last sentence indicates that the "bare soil" parameter will be 5 percent. However, recent studies at Rocky Mountain Arsenal indicate that this parameter could be 42 to 65 percent (Kulakov 2001). This apparent discrepancy

should be clarified. The technical basis for all parameters used in the model should also be provided.

## References

- Kulakov, Peter. 2001. *RCRA-Equivalent Cover Demonstration Project, Time 0 Sampling and Analysis Results for Assessment of Plant Root Development in Alternative Cover Plots at Rocky Mountain Arsenal*. Department of Agronomy, Kansas State University. February.
- U. S. Environmental Protection Agency (EPA). 1991. *Design and Construction of RCRA/CERCLA Final Covers*. EPA/625/4-91/025. Washington, D. C. May.